Journal of the Society of Arts.

FRIDAY, SEPTEMBER 26, 1856.

BRUSSELS CONGRESSES.

The International Philanthropic Congress held its first meeting on the 15th instant, under the Presidency of Mons. Rogier, supported by the Minister of the Interior. Mons. Rogier delivered the opening address.

The Free-Trade Congress was opened on the 22nd instant, under the Presidency of Mons. C. de Brouckère, Burgomaster of Brussels.

The Society was represented by Messrs. W. Ewart, M.P., J. J. Mechi, T. Twining, Jun., and Thomas Winkworth, Colonel Sykes, the Chairman of Council, having been prevented from attending by his official duties as Chairman of the East India Company.

METHYLATED SPIRIT.

(*Continued from Page* 708.)

"Strong alcohol of not more that 0·830 specific gravity should be employed as the basis of the methylated spirit. As the uniformity in quality of the wood-naphtha employed for mixing is important, it should be approved of by the Excise, and also added to the spirit under the inspection of an Excise officer. It appears to us that it would be proper to mix the spirit in the distillery, and to declare illegal the possession of the methylated spirit by a rectifier or publican. The retail sale of the methylated spirit would then fall into the hands of oilmen and druggists, who would be supplied directly by the distiller, or through the agency of a wholesale druggist or drysalter.

"Although it appears scarcely probable that the methylated spirit will ever find its way into public-houses, it is, nevertheless, desirable to possess means by which, in cases of misapplication, the presence of w ood-naphtha could be readily detected and proved in the suspected liquid. The methylated spirit which was operated upon consisted of ninety measures of spirit of wine, of density 0·828, mixed with ten measures of wood-spirit of density 0·815, and had a density of 0·823, as has been already stated, and boiled at about 170°. When the methylated spirit was deprived of all water, by distillation from anhydrous sulphate of copper, it boiled at 169°. These temperatures are both very sensibly under 172°·5, the lowest temperature at which absolute alcohol or any mixture of pure alcohol and water can boil. The possession by a sample of spirits of a lower boiling point than the last, would indicate sophistication, particularly if the low boiling point was retained after rectification of the spirits from sulphate of copper, and the fact would suggest the existence of wood naphtha in the spirits.

"The attempt to identify wood-naphtha in spirits by means of chemical tests, must obviously be attended with great difficulties, for the very applicability of wood-naphtha for the purpose of producing an unpotable mixture which can be given to the public without fear of endangering the revenue, excludes the possibility of an easy separation of the two substances; and it may be at once stated that the experiments made with the view of finding an efficient chemical process for the identification of methylic spirit have been unsuccessful, and deserve to be noticed chiefly as affording additional illustrations of the safety of the mixture which is proposed. Fortunately, methylic spirit, even when highly purified,* so as to become deprived of all the tarry and empyreumatic smell which it generally exhibits, possesses so characteristic and persistent an odour and taste, that after a little experience it is not difficult to detect its existence, even when it is highly diluted or masked by the presence of other flavours.

"Among the properties of the two alcohols on which possibly a separation might be founded, the different volatility of the two liquids at once suggested itself: absolute alcohol boiling at 173° Fahr., whilst absolute methylic spirit boils at 143° Fahr. In order to test this process, half a gallon of the methylated spirit was submitted to distillation at a comparatively low temperature, and in an apparatus which allowed the less volatile liquid to condense. The first quart which passed over was again distilled, the first pint being collected apart, and so on, until at last one-sixteenth of the original bulk of the liquid was obtained as the most volatile portion. This liquid was repeatedly distilled over anhydrous sulphate of copper, to remove any water which it might retain; it was found to boil between 168° and 169°, showing that the methylic spirit had been scarcely concentrated by this process. This fact, which at the first glance appears contrary to general experience, has been already explained; it is due, to a certain extent, to the difference of the vapour-densities of the two alcohols; for it is obvious that the smaller amount of alcohol-vapour which forms during distillation, on account of the higher boiling point of alcohol, must be compensated within certain limits by the greater weight this vapour possesses when compared with that of an equal bulk of methylic spirit vapour.

"The isplation of the methylic spirit by a series of fractional distillations having proved impossible, the mixture was now boiled for several hours with dehydrated oxalic acid, in order to produce the oxalates of methyl and ethyl. The difference in the boiling point of the two ethers (363°—321°=42°) is not much greater than that which is observed with the alcohols from which they are derived. Oxalate of methyl being at the common temperature a solid crystalline substance, while oxalate of ethyl (true oxalic ether) is a liquid, it was hoped that the fractionation of the mixture of the two ethers might be more successful, and that by repeated distillation at last a product might be obtained in which the more volatile methyl-oxalic ether should predominate to such an extent as to crystallise. Experiment, however, showed that the presence even of a minute quantity of the former ether prevents the latter from assuming the solid form.

"In studying the action of oxalic acid upon the methylic spirit, it had been observed that if a smaller amount of oxalic acid be used than is necessary for the etherisation of the entire quantity of the mixture, the methylic spirit appeared to be converted into ether with greater facility than the alcohol. Experiments were accordingly made with the view of isolating the methylic spirit by means of this reaction. The mixture was partially etherised by oxalic acid, and then submitted to distillation in order to separate the alcohol which had not been acted upon by the acid. The residuary liquid, consisting chiefly of methyl-oxalic ether, was decomposed by distillation with water. The reproduced spirit certainly contained a larger amount of methylic spirit than the original mixture; nevertheless the quantity of alcohol which it retained

* By conversion into methyl-oxalate, decomposing this substance by ammonia, concentrating the reproduced spirit, and rectifying over anhydrous sulphate of copper, which retains also the ammonia.

was so considerable that the advantages gained by the process did not appear to be in proportion to the amount of time and labour which its practice requires. A further concentration might be obtained by a repetition of the process; but this would render it so tedious and troublesome an operation as to preclude the possibility of using it as a routine test for the purpose of recognizing the presence of methylic spirit in a suspected liquid, although the process might be available for identifying and isolating that substance in cases of dispute.

"Under the influence of oxidising agents, methylic spirit furnishes, together with other products, a considerable amount of formic acid, whilst alcohol under these circumstances yields principally acetic acid. Formic and acetic acids, although closely allied in composition and general characters, still offer a greater number of points of difference than the two alcohols which they represent. Formic acid may be readily distinguished from acetic acid by the facility with which the former precipitates the metals from the solutions of the more easily reducible metallic oxides, such as oxide of silver or oxide of mercury, which are not affected by acetic acid. Unfortunately this method of testing became inapplicable, since it was found that alcohol free from methylic spirit, when submitted to the action of oxidising agents, invariably yields, in addition to aldehyde, which can be resinified and removed by potash, a small quantity of formic acid; so that the presence of formic acid among the products of oxidation of a suspected liquid cannot with certainty be regarded as an evidence of the existence of methylic spirit in the original liquid.

"It is well known that ordinary alcohol, when heated with an excess of concentrated sulphuric acid, furnishes, in addition to sulphurous acid, a considerable amount of olefiant gas. Methylic spirit, under the same circumstances, gives rise to the formation of a heavy oily liquid, which is insoluble in water, and consists chiefly of the neutral sulphate of methyl. The same liquid was obtained, together with olefiant gas and sulphurous acid, when the methylated spirit was distilled with eight or ten times its weight of concentrated sulphuric acid. But on careful examination it was found that alcohol alone, when submitted to similar treatment, yields likewise, in addition to olefiant gas, the chief product of the reaction, a small quantity of oily products (heavy oil of wine, &c.); so that the production of an oily substance from a suspected liquid by the action of an excess of sulphuric acid ceases to be an indication of the presence of methylic spirit in such liquid.

"The action of sulphuric acid upon the two alcohols produces a very different result if the latter are in excess. Alcohol and methylic spirit under these circumstances exhibit the same deportment, the former yielding ether (common sulphuric ether), while the latter is converted into methyl-ether. It is, however, well known that the etherisation of common alcohol proceeds with far greater ease than that of methylic spirit. Accordingly, the methylated spirit was submitted to the ordinary continuous etherisation-process (ten parts of wood-spirit being successively exposed to one part of sulphuric acid). It was expected that after the evolution of the ether capable of being formed under these circumstances, the methylic spirit would remain behind as sulpho-methylic acid. But the residue, neutralised with lime and distilled with water or with solution of potash, furnished no spirit, but an aqueous liquid in which no methylic spirit could be detected.

"When anhydrous baryta is dissolved in dehydrated methylic spirit, a combination is formed which crystallizes in lustrous needles, and consists of equal equivalents of methylic spirit and baryta. This substance was found to resist the action of water; even when boiled with water, it gave up no methylic spirit. It was possible that alcohol might differ in this respect; but although no crystals were observed, nevertheless a similar compound, with analogous properties, appeared to be formed; a solution of anhydrous baryta in absolute alcohol, when distilled with water, yielding scarcely a trace of alcohol.

"Lastly, a few experiments were made with the view of establishing the presence of methylic spirit in alcoholic mixtures by the dark yellowish brown colour wood-spirit assumes when left for some time in contact with either solid hydrate of potash or soda. But it was found that the brown colour assumed by methylic spirit was only little more intense than that which alcohol shows when similarly treated. Moreover, it seems to be chiefly due to the impurities, the colouration becoming less and less marked the greater the care bestowed upon the purification of the methylic spirit; the pure methylic spirit obtained by decomposing methyl-oxalic ether showing, within a moderate time, no colouration whatever, either when left in contact in the cold, or when boiled with solid hydrate of potash or soda.

"The principal uses to which spirit of wine is, or may be, applied, independently of its use as a beverage, appear to be the following:—

"As a solvent of resinous substances, which, when thus dissolved, are used in the manufacture of hats, and otherwise as varnishes. As a solvent employed in the manufacture of many chemical preparations, including the alkaloids and other organic products, which are principally used in medicine. For the production of ether, chloroform, sweet spirits of nitre, and fulminating mercury. For burning in spirit lamps as a source of heat, and for mixing with oil of turpentine or other hydrocarbons for burning in lamps as a source of light. As a solvent and menstruum for administering the active constituents of animal and vegetable substances used in medicine in the form of tincture, spirit, &c. As a solvent of essential oils and other odorous substances used in perfumery.

"1. Spirit of wine is largely used for dissolving the resins employed by hatters and varnish makers.

"In the manufacture of *hats*, shellac, dissolved either in spirit of wine or in impure methylic spirit (known as wood-naphtha), is used for giving stiffness and elasticity to the felt or other foundation of the hat, and for causing the adhesion of the nap. When wood naphtha is used for this purpose, it is necessary to make a selection of those commercial samples which are found to be most suitable. Some varieties of wood-naphtha are imperfect solvents of the resins, and are therefore inapplicable for the purpose; but even among those samples which freely dissolve the resins there is much difference in quality, commercial methylic spirit being always a mixed and very variable product, some of the constituents of which exert an injurious effect in the varnishes made with it. Spirit of wine is preferred to wood-naphtha for hat making, being, in the state in which it is met with in commerce, more uniform in quality and less contaminated with foreign matters. Hatters state that when the felt has been stiffened with shellac dissolved in spirits of wine, the felt retains its elasticity after it has been dried and hardened, without being much affected by atmospheric changes or exposure to wet, and it does not readily crack or break on being bent. But when the felt has been stiffened with shellac dissolved in naphtha, the hat, while it retains its stiffness, is liable to crack on being bent, and it readily loses its stiffness and elasticity when wetted or exposed to a damp atmosphere. Wood-naphtha is, therefore, used only on account of its low price, the quality of the hats in the manufacture of which it has been used being inferior to that of hats made with solution of shellac in spirit. In those instances in which, from competition in price, the hat-maker is obliged to use wood-naphtha, it is found necessary to use more shellac than would be required if spirits of wine were the solvent, in order to give the required stiffness and elasticity. The weight of the hat is thus increased, sometimes to the extent of several ounces, in order to

compensate for the deteriorating effect produced by the naphtha. English hatters generally complain that they have to compete with foreign makers under a disadvantage, in consequence of the high price of spirit in this country.

"In the manufacture of *spirit varnishes*, which are applied to other purposes than that of hat-making, both spirit of wine and naphtha are used for dissolving the resins. Among the varnishes of this description are included French polish and lacquer, the consumption of which, as also of other spirit varnishes, is very great. Varnishes made with spirit of wine are considered to be better in quality than those made with naphtha. With regard to French polish, those who are practically engaged in the use of this varnish say that when it is made with wood naphtha it is not so easily worked, and does not afford so durable and serviceable a polish as that made with spirit of wine. The disagreeable smell evolved during the evaporation of the wood-naphtha is also objected to, especially when the polish has to be applied to furniture in private houses, or in the warehouses of upholsterers which are visited by customers. In the manufacture of lacquer for brass and other metals, and of other sorts of spirit varnish, there are also equally strong objections to the use of wood-naphtha as a substitute for spirit of wine. Hitherto the French have been considered to excel us in lacquered goods, which may no doubt be ascribed to the superiority of their lacquer, in the manufacture of which they always use spirit of wine for dissolving the resins. English manufacturers, on the other hand, notwithstanding the inferiority of lacquer and other varnishes made with wood-naphtha, use large quantities of that solvent, in proof of which an extensive varnish-maker informed us that his consumption of wood-naphtha was equal to that of spirit of wine. There is reason to believe that if spirit were supplied to manufacturers duty free, the use of spirit-varnishes would be greatly extended, and varnished ornamental woods would frequently be substituted for painted deal.

"Among the purposes to which spirit varnishes would be more generally applied, if spirit were cheaper, may be mentioned the manufacture of paper hangings, and especially those in which imitation gold leaf ("leaf metal") is used, which, unless protected with varnish, soon becomes tarnished by the sulphuretted hydrogen always present in a town atmosphere. Not only for gilt papers, however, but for many others, and especially those used in staircases, would the application of a good spirit varnish be advantageous.

"Another application of spirit varnish would be in the production of waterproof papers, to be used as wrapping paper for steel goods, for the construction of envelopes for transmission by sea, for the manufacture of military cartridges, &c.

"Among the productions of ornamental stationery, there is a class of paper, with embossed patterns, originally called Morocco paper, but which, on account of the variety of the patterns, now appear under the more general designation of varnished papers, which are very extensively used, especially for book-binding, and for cardboard box-making; and in the production of these papers the English manufacturer is at present precluded, by the high price of spirit of wine, from the use of spirit varnish. It is admitted that this manufacture would be greatly improved by the employment of spirit varnish, as the papers, when made as at present, with oil varnish, are not adapted for exportation, on account of their liability to became heated and to adhere together.

"In some of the applications of leather, the employment of spirit varnish would be a great advantage, especially in book-binding. At present its use is restricted by the high price of spirit to the better class of bound books, but its employment not only increases the beauty of the work, but serves to protect the leather, and there can be no doubt that, if spirit were cheaper, its use for this purpose would be greatly extended.

"In the application of spirit of wine as a solvent of resinous substances for the purposes already referred to, it is not necessary that the spirit should be pure; but it is important that whatever foreign matter may be mixed with it shall volatilise without producing a very disagreeable odour, and that the resins shall be left, after the drying of the varnishes, unimpaired in quality and free from any offensive smells derived from the solvent.

"There is reason to believe that a considerable quantity of illicit spirit is supplied to a certain class of hatters and varnish-makers, to the injury of the revenue and of the honest manufacturer. We are informed that this illicit spirit is sold for about 12s. per gallon, at 60 over proof.

"As the employment of spirit for dissolving resinous substances appears to be the most extensive and important of its applications in the arts and manufactures, it was necessary to ascertain whether spirit mixed in the manner proposed in this report is applicable for such purposes. With a view of determining this point, experiments were made by ourselves, and were also kindly undertaken, at our request, by gentlemen practically engaged in the several departments of manufacture referred to. The results have fully satisfied us that the methylated spirit is suitable for all these applications. We are indebted for much valuable assistance, in reference to this part of our inquiry, to Messrs. J. T. and E. Christy and Co., and Messrs. Cooper, Box and Co., hatters; to Mr. Rea and Mr. Heywood, varnish-makers, and to Mr. Warren De la Rue.

"2. Spirit of wine is employed as a solvent in the manufacture of many chemical preparations, including the alkaloids and other organic products, which are principally used in medicine. In manufacturing the alkaloids derived from the cinchona barks, spirit is used in one part of the process. Indeed, alcohol appears to be the best and most general solvent for this class of substances. It is used in the manufacture of veratrine, and is required for crystallising morphine, although this alkaloid may be prepared from opium without spirit. It has hitherto been the object of English manufacturers to discover processes for the preparation of chemical products without the use of spirit, and such processes are sometimes adopted to the injury of the product. Spirit of wine may be advantageously used in the preparation of some inorganic salts, such as protosulphate of iron, which, when precipitated from its aqueous solution by means of alcohol, is less subject to change from exposure to the air than it is when crystallised in the usual way. The resinous constituents of jalap and scammony which are used in medicine are separated from the drugs by means of spirit of wine, and the use of this solvent might no doubt be greatly extended for similar purposes with advantage. In some cases the manufacture of chemical products has been lost to English manufacturers in consequence of the high price of alcohol or of ether, which is made from alcohol. Thus, pure tanin, the preparation of which involves the loss of a large quantity of ether, is imported from abroad at a price at which it cannot be produced at home. Among this class of productions, involving the use of spirit of wine as a solvent, may be mentioned transparent soap, a pure and elegant preparation for the toilet, which is much used in those countries in which alcohol is cheap, but which, from the high price of the solvent, is but rarely made and little used in this country.

"For all the purposes here referred to, the methylated spirit appears to be applicable. In addition to our own experiments we have been favoured with a statement of results obtained by Mr. T. N. R. Morson in the preparation of chemical products, and by Mr. Pears in the manufacture of transparent soap."

(To be continued.)

LEWES MECHANICS' INSTITUTION.

The opening lecture of the session at this Institution was delivered on Wednesday evening, by the Rev. Dr. Booth, F.R.S., treasurer of the Society of Arts, on the most effectual means of promoting the education of the country. The rev. gentleman spoke as follows:—

At the request of your president and committee, I appear here this evening to give you some information concerning the progress of popular education in this country, and to discuss the most effectual means of promoting it. I will address you in plain and homely phrase, because what I propose to speak to you about is a matter of business, in which every one of you is personally interested, and I will, as far as I can, abstain from the introduction of political and religious topics, on which there is ,and always must be, a great diversity of opinion. Now I am not going to talk to you about the utility or the dignity of education. All that is settled. The necessity of education, the want of useful instruction, is admitted. We must not, however, act so unfairly as to judge with harshness those who in former years took the other side of the question. They looked at it with the light they had reflected to them from the aspect of their own times, and their excuse will not be far to seek, if we only bear in mind what was looked upon as education some century or even not so long ago; if we only remember that the great discoveries in natural science which have signalised our own times had not yet been made, and that commercial rivalry and the competing industries of foreign nations had not begun to press unduly on the virtual monopolies of our manufacturers. They viewed things from the standing point of their own time, and we must not find fault with them, if the higher eminence to which we are raised discloses to our view a wider horizon of responsibilities and duties. I am not prepared to discuss whether a rural population, living in what has been called the Arcadian simplicity of a country life, without either trade or manufactures, colonies or commerce, might not constitute a happier state of society than this present one of ours, in which men in their breathless haste to go-a-head in the race of life, cross and crush, and jostle one another; in which association is only another name for competition, in which individual energy and intensity of will are every day becoming of more importance as elements of success in the battle of life which every one of us has more or less to fight. But we have to deal with actually existing facts; it is, therefore, of no practical use to moralise on the relative advantages of states of society widely different from that in which it is our lot to live. The facts are there, and we must make the best of them. Not only does the principle of competition govern the relative advancement of individual men in the same society, but nations, too, have entered on that course in their rivalry with one another. Who does not know that for years past the most strenuous exertions have been used to supplant the commerce of England, and that the most untiring efforts are being made to lower her manufacturing supremacy? If they have not hitherto been successful, it would be premature in us to boast that success shall never reward their perseverance. The life, the history of a nation is not measured by years but by centuries. We enjoy many advantages over continental nations in our vast capital and enormous commerce, in our facilities of transport, our numerous railways and multitudinous shipping, in the stability of our government, and the contentment of our people. But we have, on the other hand, many draw-backs in the general ignorance of our masses, in our overweening opinion of ourselves, in our obstinate resistance to change even when change would be a manifest and admitted improvement, in our apathetic tolerance of abuses, provided they are of long standing, and of "Circumlocution offices" if the officials who "show how not to do it" are sufficiently respectable; these are the things which, let to run their course, will slowly but surely eat into the heart of the nation. Now such being the race that is set before us, whether nationally or individually considered, we have all of us, I believe, in these times of ours, come to consider that education based on sound instruction in those things with which we shall have more or less to deal through life, is one of the greatest if not the very greatest need of our time. Education is no longer a luxury, it has become a necessary of life. Without it a man sinks rapidly in the social scale; if poor he becomes a hewer of wood and drawer of water; if rich and harmless, he is an incumbrance; if otherwise, he is a positive nuisance to society. He stands in the way, and is sure sooner or later to be hustled out of his place. Now the establishment of institutions such as this all over the country, originally intended for the improvement of the middle and working classes, is a sort of national acknowledgment of this want, although it may be that in some instances they have been diverted from their legitimate objects, and I am rejoiced to see that latterly there has been a more general recognition of their proper uses. No one is more willing than I am freely to admit that relaxation is a necessary sequel to work. Man is not constituted like a steam-engine; he must have intervals, not only of rest but of relaxation. Mind and body are equally used up and worn out by continuous labour and unceasing application. The human frame was not constructed to stand such wear and tear. We are told on the highest and holiest authority, at the very dawn of civilisation, when man's energies and bodily strength did not undergo a tithe of the strain they are subjected to at present, that one day in seven was not too much to give up to rest from labour, both of mind and body. And I cannot but consider that the substitution of mere mechanical insensible agents, such as gunpowder and steam, to do the work that had previously been got out of human bone and human muscle, is one of the very highest grounds on which science can confidently claim the suffrages of mankind. Only just consider the amount of work performed by the thousands of steam-engines and locomotives in this country. What an aggregate of animal toil, pain and suffering do they represent? The well-known story in the Eastern tale is realised, for the steam-engine is the true slave of the lamp. Even the very latest gift of science to the arts commends itself to humanity by substituting the mechanical and insensate action of the viewless air for the laborious, unhealthy, and unbearable process of puddling iron as it is called, in which half-naked men, with long iron bars in their hands, stand before the glowing mouths of roaring furnaces, and mix and blend the molten metal raised to a white heat. It is the same in every other department of human industry, in every section of man's knowledge. The habitudes of space, and the properties of matter in all its multitudinous forms of gaseous, liquid and solid, have been as it were, shut up in them, like the oak in the acorn, that man's understanding year after year, and age after age, might find its work in drawing out, sometimes one by one, again by handfuls, those secrets which all of them tend more or less to ameliorate the condition of mankind, the true scope and legitimate aim of all science in the opinion of Lord Bacon. Now such being confessedly the advantages of science, and I may add of knowledge in general, the question naturally shapes itself in your minds somewhat in this form:—How is an acquaintance with science to be obtained by men who have but a small amount of leisure, a scant supply of books, no apparatus worthy of the name, and the opportunities of attending lectures few and rare. We have no teachers, no lectures, no apparatus, you will say. I am taking the most unfavourable case that can be supposed. We have but little time to spare, and but little money to spend. We must only sit still and continue as we are until these things are all provided for our use, either by private spirit or by public liberality. But I much fear if you are to wait until all these things are accomplished,

until you have a building free from debt, and taking its proper place among the institutions of your country—if you wait until you have warm, well-ventilated rooms, and a complete set of perfect apparatus for the elucidation of every science you propose to learn—if you are to wait for a staff of experienced teachers to be provided to teach you all those branches of knowledge you may desire to know, the prospect of your mental improvement would be a very remote one indeed. You will ask, then, what is to be done? Now in answer to this I wish to place before you a great truth, which somehow seems to have been overlooked in our educational discussions. It is this, that learning must come from within, not from without—that listening to a lecture is not learning—that looking at a man making experiments does not teach you to manipulate in science. Only think of a man learning to make shoes, or to sing, or to play on a musical instrument, by attending lectures on shoemaking or music. Believe me, as there is no royal road to literature, there is no railroad to the temple of science; "coaching" may take a man part of the way, but it invariably leaves him worse prepared to encounter the difficulties of the rest of the ascent. He who wishes to mount must gird up the loins of his mind. Lecturers and teachers are all very well to keep idle boys to their work and to stimulate the indolent. They are also useful, like finger-posts, to point out the road you should follow, but they will take you very little of it. A man can no more learn by the sweat of another man's brains than he can take exercise by getting another man to walk for him. All mental improvement resolves itself ultimately into self-improvement. The food of the mind is like the food of the body—it must be assimilated before it can benefit the system. I do not mean to deny that teachers are of use to those who are beginners in the elements of any branch of knowledge, just as corks are to those who are learning to swim, or as an infant requires to be held up by its nurse when first attempting to walk. Let this be a great encouragement to him who desires to learn, who with a moderate share of ability has, above all things, that strength of purpose and energy of will which will carry him through. If there be such among you, let him be assured that the differences between the facilities which the rich and poor respectively have for acquiring knowledge are not so great as is commonly imagined, especially in this country, where a man can procure for a few shillings the very best manuals and text-books in almost any branch of literature or science. He need not even go to that expense; he may join an Institution, such as this, and have the use of all the books he may require for a few pence; and I may here, by the way, remark that one of the greatest improvements in the means of educating the people, is the revolution which has taken place in the book trade during the last few years. A working man may now buy for a few shillings, or even for a few pence, under the guise of cheap paper and inexpensive printing, standard works that, a few years ago, would have been entirely beyond his means. You may buy a Cassell's Euclid for a shilling, an arithmetic for the same, a treatise on chemistry for a couple of shillings. These are your best teachers. They will not get impatient at your slowness, or angry with you because of your stupidity. Your books will not tire in giving you information; they will repeat it for you again and again. If you have misunderstood anything they have said, or are slow to comprehend them, they will wait patiently for you until you are ready to proceed with them. They will put up with your ill-humour, they will bear with your mistakes, and it will cost you but little to keep them. It is my undoubting conviction, that there is no one here present this evening, whom God has gifted with a moderate average share of ability—great talents are not required—and who has strength of will to carry him over the obstacles he is sure to meet with at the outset, in commencing to learn any subject, that cannot master any science or language for the comprehension of which he has been furnished with the necessary natural ability. I do not say that it *is within* the compass of every man's understanding to become a profound mathematician; men's minds are not constituted all alike; their understandings are as various as their faces; but such a one may become an accomplished linguist, or an expert chemist, or a keen observer of the manifold operations of nature. The Almighty has supplied us with subjects of thought as diverse as the phases of the understanding. But, you will say, though books are cheap, and may easily be procured, we have no apparatus, and apparatus are scarce and dear, beyond the means of the poor man to obtain, Now, here is another error. There is a great deal too much talk about apparatus for teaching science, and the necessity there is that the State should manufacture it, and supply it at a cheap rate to schools and to Institutions like this. A man who is eager to learn—who is determined to know his subject—may, if he be at all handy, or with the assistance of the village carpenter or blacksmith, extemporise his apparatus. Polished mahogany, and expensive brass-work and complicated adjustments, are not at all essential. It is told of the celebrated philosopher, Dr. Wollaston, the inventor of the method of rendering platinum malleable, that when a continental chemist of some celebrity called on him, and expressed a wish to be shown over the laboratories in which science had been enriched by so many important discoveries, the Doctor took him into a little study, and, pointing to an old tea-tray on the table, with a few watch glasses, test papers, a small balance, and a blow-pipe on it, said, "There is all the laboratory that I have." Believe me, whatever science you take up to learn, costly apparatus are not necessary—they are only the charlatanism of science. Now, do not mistake me; I am speaking about learning the elements of science, not of making discoveries in it. To make discoveries in astronomy, a telescope like that of Lord Rosse would be required. To carry on investigations in botany and other departments of natural history, very complicated, highly finished, and very costly microscopes are a necessity, while a microscope amply sufficient for educational purposes may be bought for ten shillings. Again, the poor hardworking young man may say, "How can I compete successfully with a man of ample means and plenty of leisure time at his disposal, who has so many favourable opportunities for improving himself—so many aids and appliances in the shape of expensive books, and costly apparatus, and experienced tutors provided him?" Now, this is an error. The ways of Providence are not so unequal, after all. The young oak that is nurtured in the hot-house will never become the monarch of the woods on the exposed hill-side. There are parasitical plants that stunt and choke the tree they seemed to shelter. The minds of men so brought up are too often without spring; they are deficient in elasticity of intellect, and they often want that one moral quality of mind which breathes life and vigour into all the intellectual faculties, the absence of which no others can compensate, even by their presence in excess, I mean that unflinching determination not to be borne down by difficulties—that enduring perseverance not to be over-mastered by defeat. He among you who can put forth into action such energy of will does not much require external aid. He need not care whether the schoolmaster be abroad or not, for he has got him at home. This is no mere theoretical reasoning. The views I place before you are amply confirmed by experience. Read the biographies of those men whose names shed lustre on humanity, whose lives are our best instructors, teaching us by their example, and encouraging us by their success. I have little doubt that in the minds of other men, perhaps of great sagacity and far reach of thought, before Columbus's day, the existence of a great western continent may have been a dim conception, a mere geographical possibility. That the earth may be circumnavigated, or at all events travelled round,

is a truth which follows at once from the admission of its globular form, but the germ of this truth fell on ungenial soil; it never fructified in their minds. Columbus was not the last by many who showed how the impossible may be reduced to the practical. It was the indomitable resolution of Columbus, his unyielding energy, that enabled him to verify his conceptions, and to realise his theory. Look at the perseverance of Kepler, who for years and years groped his way through dry perplexed and endless arithmetical calculations till he saw that first faint ray of light, which burst out as the sun in the mind of Newton, and revealed those laws concealed since the creation, by which the Almighty constituted the mechanism of the universe. Turn where you will, you find indomitable perseverance the indispensable condition of success. Who is there so cold as to read without emotion the heroic struggles of that brave old Huguenot, Bernard Palissy, the potter, who, despite of failure after failure, the ridicule of enemies, the sneers of friends, the remonstrances of his family, still held on, till a success unhoped for at last crowned his efforts. Or, if we wish to take a more fortunate example in our own country, we may name Sir Richard Arkwright, the great inventor of the cotton spinning machine, who, till he was thirty years of age, continued to practise as a barber in his native town. The characteristic quality of his mind was not deep-thinking, but unyielding tenacity of purpose. If any one who hears me is disheartened by his daily toil, or discouraged by the want of books, let him read the autobiography of the late William Gifford, for many years the learned and talented editor of the *Quarterly Review*. Of his early life he thus writes, "I possessed at this time but one book in the world, it was a treatise on algebra, given to me by a young woman who found it in a lodging house. I considered it as a treasure. I sat up for the greatest part of several nights successively; this carried me some way into the science; I had not a farthing on earth, nor a friend to give me one. Pen, ink, and paper were, therefore, for the most part, as completely out of my reach as a crown and sceptre. There was, indeed, a resource. I beat out pieces of leather as smooth as possible, and wrought my problems on them with an old, blunted awl." Now, here was a man, almost without books, and entirely without instruction or apparatus of any kind, who contrived to master the elements of a sound education, which eventually led him to power, eminence, and wealth. Not less true than trite is the proverb, that necessity is the mother of invention. Difficulties overcome habituate the mind to overcome difficulties. Do not for a moment imagine that if you pore in solitude for hours, say over a mathematical problem, or any other difficulty, and fail even at last to obtain the result you are in quest of, that, therefore, your labour is but lost, and your time thrown away. Do not suppose anything of the sort. Your mind has been at work the whole time. Other things which were before clouded have become clear; principles have been sinking deeper into the mind, and cutting a groove in which your ideas will run with greater ease another time. Had the difficulty been explained immediately it had arisen, the chances are that you might never have known exactly what it was. There is a resemblance or analogy which pervades the entire moral and physical creation. In tropical regions, such is the productiveness of the soil, that a few hours light labour provides an ample supply of food for the entire year. And what is the consequence? Man in those luxuriant countries, in the midst of boundless plenty and exhaustless vegetation, is hopelessly sunk in the depths of ignorance and barbarism. No, man's nature is improved as his wants are multiplied. We may apply to the Georgics of the mind those noble lines which the Roman poet addressed to the tillers of the soil:—

Pater ipse colendi,
Haud facilem esse viam voluit, primusque per artem
Movit agros curis acuens mortalia corda,
Nec torpere gravi passus sua regna veterno.

It is a very remarkable and curious fact, that there is no acquirement of real value, whether it be a science you want to know, or an art you require to practise, or a language you wish to learn, that does not demand a large expenditure of labour for its acquisition. So true is this, that the amount of labour and pains bestowed is the measure of the intrinsic value of the acquirement. One never opens a diamond mine while turning up the soil for knowledge. Chance has very little to do with the extension of knowledge. Thousands had seen apples fall to the ground before the time of Newton. But it was to his mind only that the simple fact was suggestive. It fell upon a mind prepared for its reception. Everybody knew that oxygen is a supporter of combustion, that it is largely present in the atmosphere, but it was only the other day that the simple obvious facts were applied to compel the air we breathe to supply fuel to our iron furnaces, a process which bids fair to revolutionise the whole iron manufacture. Great discoveries are everywhere cropping out beneath our feet, if we would only look before us. See what vast discoveries in chemistry and natural science were due to Sir Humphrey Davy, and I mention him the more willingly, as he is another and a signal example of a man who, born in a humble station, by the brilliancy of his talents, his unrelaxing perseverance and intensity of will, raised himself to high social position, and took his place as the very first of European philosophers. When a surgeon's errand-boy in Penzance, he attempted to make experiments on the properties of air; and what, you will be curious to know, was his laboratory. Why the phials and bottles of his master's shop. His biographer, with great justice, observes, had Sir Humphrey Davy been furnished, in the commencement of his career, with all those appliances he enjoyed at a more recent period, it is very probable that he might never have acquired that wonderful tact of manipulation, that ability of suggesting experiments, and of contriving apparatus so as to meet and surmount the difficulties which must constantly arise during the progress of the philosopher through the unbeaten tracks and unexplored regions of science. The self-taught mechanician and astronomer, Ferguson, when watching his master's sheep by night, used to lie on his back, and note the relative distances of the stars by means of beads strung upon a string. The profound mathematician, Pascal, drew his geometrical diagrams with a bit of coal. A celebrated painter (I forget of whom the story is told) first became known by his drawings with a bit of chalk. But why further pursue these illustrations of genius, seconded by the energies of a determined will, overmastering difficulties. I should tire you out long before I had exhausted a tithe of the instances one might lay before you of men, some of them with only a very moderate amount of intellectual capacity, but all strongly-marked by great pertinacity of purpose, power of concentration, and development of will, who without social position, steeped to the lips in poverty, yet conscious of the gifts with which God had endowed them, have encountered difficulties, battled with adversity, defeated it may be often, but still renewing the conflict, until at last they come forth, the guides, the ornaments, and benefactors of their kind. To witness the struggles of a good man contending with adversity, it has been said, is a noble sight. To witness the struggles of a youth fighting manfully the battle of life, is a spectacle which excites, or ought to excite, our deepest sympathies. Surely, if it be true that Nature, or rather Nature's God, never acts in vain, it must have been designed that the rare gifts with which Providence has endowed some individual men, taken here and there out of the great mass of mankind, without any reference whatever to rank or station—the peasant boy is as richly endowed as the peer's son—surely, I say, it must have been intended that those priceless, because unpurchasable, gifts should be cultivated, and developed for the general benefit of all Hence it is that, by a figure of speech, the word which

in a certain connection familiar to all of you, signified money placed out in trust to be augmented and improved, has actually come specially to stand for mental endowments, and the word "talents" no longer signifies pieces of ancient coins, but that mental treasure which God has committed to the charge of some of us for the general advancement of mankind. Consider the many advantages which even the very poorest of you have, as compared with those that fell to the lot of these illustrious men, some of whose names I have placed before you. If they could accomplish so much in the face of poverty, the neglect or contempt of their fellows, in solitude, without sympathy, without books, without apparatus, how much more ought to be expected from you, who live in happier times, when all those things, of which they felt the want, are in a great measure supplied to you. You have all the facilities which books, lectures, and teachers can afford. But, you will say, we cannot all hope to become like Arkwright, or Davy, or Stephenson, or Herschel. You do not tell us of those "mute inglorious Miltons," who have gone to their rest, "to fortune and to fame alike unknown." This is but too true. Who shall say how many men of transcendant genius have perished in the depths of their obscurity, kept down by want, misfortune, and despair? Hoping against hope, long and watchfully did they wait for that opportunity which never came. Moreover, who shall say how many great discoveries, how many useful inventions, may have been lost to the world, never to be again brought to light, or if so, ages hence perhaps, because they perished with their inventors. Who shall say of how many others may the germs have been blighted in the bud by the chill shade of obscurity and neglect. It is, indeed, saddening to reflect how many of the choicest gifts of God to man have thus perished unused, unknown, uncared for, and forgotten. Such waste of intellectual wealth has been an untold loss to society, for we cannot gauge how much it may have retarded its advancement. We may attempt to estimate it somewhat vaguely in this way; let us make the supposition that neither Homer, nor Shakespere, nor Milton, nor Newton, nor that crowd of illustrious worthies, whose early years were passed in poverty and privation, had ever emerged from their obscurity, and enriched us with "those thoughts that breathe, and words that burn." Who shall sum up the whole amount of damage that in the case I am supposing would have been inflicted on mankind. Would the untold millions now buried in the dried up channels of the preadamite rivers of Australia or California recompense society for the loss. But I would take a still lower ground, and ask, would all the treasures of Peru compensate the manufacturing industry of this country, in lieu of the discoveries of Watt, and Arkwright, and Cort, and Stephenson, and Wheatstone, with a crowd of other little less illustrious names. From the amount of our actual gains, we may form some notion of our unknown loss. Let us live in hope that this at least shall be amended. That merit however retiring, and genius however obscure, shall have a fair field thrown open to them; they ask for and they want no favour. This the society which I have the honour to be connected with, now proposes to some extent to attempt. The Society of Arts of London, whose Royal President, aided by its Council, not only matured the crude notions of an international display of works of industry and art into a grand conception, but realised it as a fact in the Palace of Industry of all Nations, erected in Hyde-park, in the first year of the present half century, the same Society are now prepared to carry into intellectual matters that principle of competition which was then sanctioned and confirmed in material things. We propose to hold public examinations conducted by men, some of them of the very highest eminence in literature and science. We commenced the system last June, at our house in the Adelphi, and the results were, indeed, most flattering and unexpected. For the information of those here present, who may not be fully acquainted with what the Society of Arts is now doing—I will give you a brief account of our proceedings. In the first place, you are all, no doubt, aware that the principal Mechanics' Institutions of the country, nearly 400 in number, are in union with the Society of Arts. To ascertain how far our proposal might obtain the sanction of the friends of education, and of the great employers of labour, whether intellectual or bodily throughout the country, we issued for signature a declaration of confidence in our fitness to undertake such a task, and of opinion affirming its importance. Although our scheme was not matured until the February of last year, or put forth to the world, as one that would be actually worked out, until the beginning of April, yet we had no less than 56 candidates at our examinations in the Society's House in the Adelphi, which extended over four days, the 10th, 11th, 12th, and 13th of June, for nine hours each day. Now you will be curious to learn the results of that examination. Our best mathematician was a young man from Leeds, a bookseller's shopboy. He passed so good an examination that the managers of the Kew Observatory, much to their credit, have appointed him Assistant-Observer, a situation which, to one of his predecessors, opened the way to rank and fortune. Within the last few weeks the Council of the Society of Arts have come to the determination to establish a public Registry of their certificated candidates, which they propose to throw open, free of charge, to all those persons who may desire to make merit and intelligence the qualifications of those whom they may employ. Our examinations will be conducted with the most rigid impartiality, and with the greatest strictness. Indeed, the examiners know nothing whatever about the candidates, as they recognise them only by the number on their cards of admission. The Society of Arts, through its Board of Examiners, pledges its credit and character that the certificates which it issues, whatever the grade, shall state with the most precise accuracy attainable, and without the least tincture of exaggeration, the clear, uncoloured truth. It is this truthfulness that will constitute the entire value of our certificates. But now some among you may object to this plan of general examinations, and say, examinations do not communicate knowledge. This is quite true; our Society does not profess to teach. It leaves education, and the instruction which is the chief instrument of education, in the hands of the various educational institutions throughout the country, whether they be schools or colleges, Trade schools or Mechanics' Institutions. But it does profess to test and set its seal to the attainments of those whom it examines, in the shape of the certificates it awards and the prizes it bestows. It is too much taken for granted by educators in general, that when you have built a school-house, divided it out into class-rooms, hung the walls with maps and diagrams, and appointed a teacher with a committee of management, education must go on as it were by machinery. Though you catch your boys and impound them in your school-rooms, you cannot force them to learn. But once hold out to your pupils the inducement that every hour they give to hard labour, to real head work, will tell on their future mental position and prospects of life, mark what a face of reality it will put upon all they are doing, how their attention will be awakened. I have had many instances of this brought under my notice during the last few months. Now look at this matter from another point of view. The son of the nobleman or the country squire, when at one of the public schools, has all the rewards the University can bestow full in his view: its honours, its prizes, its scholarships, its fellowships, its professorships, are all within his reach. The very highest honours a subject can attain to, loom in the distance. What stimulants are these to unflagging exertion. Do not motives such as these invigorate and confirm the "constant will" to persevere to the end? What

inducements equivalent to these—I do not say equal, but even like in kind—do we hold out to the youth of the middle and lower classes? Why should the son of the tailor or the shoemaker or greengrocer pore in solitude over books, and filch from idle sports and boyish amusements the few hours he can abstract from daily toil? He may become a profound mathematician. Who knows, or cares anything about it, or thinks he is other than a mere pretender? He may become a great chemist; who believes him? or a good botanist; who puts faith in his pretensions? The pure gold passes for base metal, because there is no legitimate authority to stamp it with the impress which would make it current. But for the Society of Arts, who would have ever heard anything about those young men who obtained our certificates, or known anything of their attainments. Chambers would have remained in obscurity, selling books in a little shop, or working problems in solitude, had not the Society of Arts dragged him forth out of darkness into light. Few of you, I dare say, knew that you had a very promising young chemist among you until the Board of Examiners had awarded a certificate in chemistry to your townsman Charles Wells. I know it may be said, as it often has been said, knowledge ought to be cultivated for its own sake: the pleasure of its acquisition is its own best reward. Now, this is one of those conventional platitudes which usually garnish after-dinner speeches, and which take in nobody, neither him who hears them nor him who utters them. Who follows trade, or commerce, or business of any kind, or professional employment, but as means to an end? The lawyer does not plead causes for the sake of pleading; the manufacturer does not weave for the pleasure of contemplating mounds of cotton goods; a young man at college works hard for a fellowship, and why are we to expect in the poor man that abnegation of self which we do not look for in the rich? I am free to grant that when a man becomes profoundly versed in any branch of knowledge, he is then apt to pursue it for its own sake; his toil becomes a labour of love; at length he falls into

> "That last infirmity of noble minds,
> To scorn delights and live laborious days."

If the Society of Arts succeeds in its present plans for improving instruction and raising the tone of education, as it assuredly will if we continue to receive that large amount of sympathy, encouragement, and co-operation which hitherto has been so freely tendered to us, a great change will be effected in the way in which work is done, and the business of the country transacted. Let us briefly examine the probable working of such a scheme in actual operation. If every boy who goes to a commercial school, or every young man who attends classes at a Mechanics' Institution, were convinced of this, that the Society of Arts' certificate, under seal, was a sure passport to recognition and employment, can you not see what a great encouragement you give, what a strong motive you hold out to increased and intensified exertions. Again, consider how the Society of Arts' Examination would serve as a sort of educational test of the relative merits of different colleges, and schools, and classes. Success at the Society's Examinations would test the kind of instruction given, precisely in the same way as the Universities indirectly control, guide, and test the instruction of our great public schools. There are other advantages, too, in this plan. It imposes no necessity of building new colleges or schools, or establishing professorships; it takes the materials and tools provided to our hands and operates upon and by them. We do not propose to establish rival schools or antagonistic colleges to those already in existence, but endeavouring to deal with those we have, we shall not interfere with any vested rights, whether real or supposed. Co-operating with all, opposed to nothing but pretence and sham, we shall neither provoke hostility nor alarm suspicion, and as we respect the rights of conscience and the religious feelings of every class, our proceedings will have no tendency to excite sectarian animosity; there will thus be no ground for the separation of religious education from secular instruction. Both being left in the hands of the people themselves, their union will be secured with the utmost safety. And is not this view actually confirmed by the fact, that men whose names were never found in juxta-position before in matters of education, or indeed in anything else, have signed our declaration. Our declaration is headed by the Archbishop of Canterbury, followed by the Bishop of Bath and Wells, the Bishop of Oxford, the Bishop of Winchester; then come the names of Mr. Edward Baines, of Leeds, the educational chief of the Dissenters of the North of England, of Mr. Apsley Pellatt, their political representative in the House of Commons, and Mr. Fox, the Member for Oldham, the advocate of separate secular education. Neither have we any political aspect. Amongst our host of signatures will be found those of Lord Ashburton, that zealous advocate of popular education, Lord Stanley, Sir James Graham, Robert Stephenson, and many others of every religious sect and political party. And now, before I conclude, let me ask you, the public, and through you the friends of education and progress all over the length and breadth of this great country, to co-operate with the Society of Arts in the noble work it has undertaken? How are we to co-operate, you will say, is it by subscribing money to the funds of your Society? Nothing of the sort. We do not want your money. The Society of Arts has an income of nearly £5,000 a year, which being economically and judiciously managed, is amply sufficient for the development of its public objects. But you can most effectually promote this movement and benefit yourselves at the same time, by taking into your counting-houses, warehouses, shops, manufactories, mills, and factories of every kind, those young men who, by obtaining our certificates, shall have proved themselves to be intelligent, laborious, studious, and diligent. Several merchants and manufacturers of the highest eminence in the country, have promised us their co-operation in this way. That enlightened friend of education, Mr. John Wood, the Chairman of the Board of Excise, has placed appointments at our disposal. In this way we propose to stimulate the intellectual activity of our candidates. Their moral characters you must scrutinize for yourselves; we profess to give no guarantee on that head; we undertake to answer only for diligence and acquirements. Yet I believe it will be found that in 99 cases out of every 100, "a young man who must necessarily have devoted to study a large portion of the time at his disposal, often very scant, can scarcely have had much leisure for idle pursuits or vicious indulgences." We shall afford you every information in our power, free of charge, with respect to the antecedents of our certificated candidates, for we shall register no other; we shall tell you what sort of examinations the candidates have passed. Indeed, you may see the questions and answers of every candidate, for we file them all. Now, by so doing, you will not only secure the services of well informed and intelligent young men, but you will do more than this. There is not an appointment which shall be thus filled up, however humble, avowedly on the Society of Arts' testimonial, that will not induce hundreds of others to turn their attention to self-improvement. You will infuse strength and determination into many a will that before had been wavering and weak. And this is the great point, as I have said in the early part of my lecture. In benefiting yourselves you promote the welfare of your country. England has indeed attained to a high standing among the nations; if only true to herself, a brilliant destiny awaits her. But a dark spot mars the brightness of her aspect, and that the Society of Arts, so far as its power and influence prevail, will strive to remove. We will endeavour, in our humble way,

that incompetence, stupidity, imbecility, idleness, and ignorance shall no longer usurp the places of skill, of genius, of vigour, of industry, and knowledge. I have done; and I thank you for the patience with which you have heard me.

TIMBER BENDING MACHINERY.

IT will be remembered that in the Annexe in the French Exhibition last year there was exhibited an American invention for bending timber, whether large or small, the object being to convert straight timber into ships' knees, futtocks, and other forms required in naval architecture, as well as for producing the curved forms employed in the manufacture of furniture, wheels, &c. The name of the inventor is Mr. T. Blanchard, of Boston. A company has lately been formed in this country for carrying out the invention, which consists in so conducting the process that the piece of timber is subjected to pressure on all its sides during the bending, in place of being simply bent over a form, as has heretofore been the practice. By this means the wood is prevented from swelling or bursting, as it is liable to do when bent without such support. The apparatus employed for large timber consists of a lever, which turns on a centre or axis; to the lever is attached a trough, of the curve to which the wood is to be bent, one side of the trough being moveable, so that it may be pressed firmly against the surface of the wood by wedges. Underneath the lever is a travelling table, the distance of which from the curved form can be adjusted by a screw.

The piece of timber is laid on a flexible band of metal, placed on this table, and clamped down thereon, so that it is pressed upon all sides; one end of the timber is then clamped to the forepart of the curved trough on the lever, the other end of the timber buts against a block, acted on by a screw. When this is all arranged the lever is drawn down, during which operation the timber passes into the curved trough; when this is done the two ends of the wood are connected together by a tie, which takes hold of the ends of the flexible band before mentioned, the wood still confined by the curved trough; the flexible band and the tie are removed from the machine, and are so held until it is set. The time occupied in bending a piece of timber, say 15 feet long, and 12 inches by 9 in section, is about 20 minutes.

Dr. Hooker has examined microscopically specimens of different woods which had been subjected to the process, and in his report on the Paris Exhibition states that the qualities of hardness, rigidity, and durability have been greatly improved.

For bending small timber a much simpler machine is employed, and the pressure is confined to the ends of the piece during the bending process.

The following account of experiments lately made in New York is taken from the *Scientific American*. The experiments were continued six days, and a series were conducted under the inspection of B. F. Delano, Esq., naval constructor, Brooklyn, and Lieut. Worden, U.S.N., by order of the Secretary of the Navy. The object of the experiments was the testing of the relative strength of natural and machine-bent ship-knees, the artificial knees being bent at the factory in Greenpoint by the machinery, and according to Mr. Thomas Blanchard's process:—

"The machinery for testing the strength of the knees was got up under the charge of Mr. Davidson, of the Novelty Works, who conducted the trials. It consisted of a cast and wrought iron bed and frame, in which the ship's knees (one at a time) were secured, and the breaking force applied by a powerful hydraulic press, operating upon one end of each knee, with the fulcrum at or near the centre of the throat, the other part of the knee being firmly fastened, to prevent it yielding.

"The first experiment was with a machine-bent knee, of 10½ inches siding. With a leverage of 5 feet 4½ inches, it was sprung or squeezed inwards by the press, a distance of 1 inch, by 7,500 lbs. (total pressure); 2 inches by 9,500 lbs.

"The experiment with a *natural* knee of 10½ inches siding—same angle as the machine-bent knee, and conducted in the same manner—gave a lower degree of strength. It was sprung inward 1 inch by 5,500 lbs. pressure; 2 inches by 9,500 lbs.

"The next machine-bent knee of the same siding, 10½ inches, was sprung 1 inch by 9,500 lbs. pressure; 2 inches by 11,000 lbs. pressure.

"The next *natural* knee of same siding and angle as the bent knee, was sprung 1 inch by 7,500 lbs. pressure; 2 inches by 10,500 lbs. These experiments were of the crushing character, operating in the direction to squeeze the ends of the knees together.

"The hydraulic press was then reversed, for the purpose of forcing the knees outward—riving them apart. It was an interesting trial, as it had been supposed by many that a knee or stick of artificial bent timber could be easily brought back to its original shape; but it was found more difficult to force it outwards than inwards.

"A machine-bent knee of 10½ inches siding, with a leverage of 5 feet 4½ inches, was sprung outward 1 inch by a pressure of 14,000 lbs., 2 inches by a pressure of 22,500.

"The question was then raised that the pieces of timber which were bolted on the knee to represent the deck beam and the side of the ship as they butted closely together, greatly increased the power required to spring the knee outwards. For the purpose of testing this, the end of the beam was cut off, so that the ends of the timbers were entirely open and free of each other. The pressure was continued until the knee had sprung outward 10 inches, when it was taken off, and it went back 5 inches. The pressure was then applied the second time, and upon reaching the point where the strain had been taken off at the first trial, it required to spring 1 inch 28,000 lbs. of pressure, thus showing that it required more than double the power to strain outward than inward. The knee was sprung ten inches without the least break, at a pressure on the last half-inch of 38,500 pounds.

"The last natural knee of the same angle as the foregoing bent knee, with siding of 10½ inches, was a remarkably fine specimen. With a leverage of 5 feet 4½ inches, it required, to spring it outward 1 inch, 22,500 lbs. pressure; 2 inches. 38,500 lbs. pressure: at this point it broke near the centre of the throat.

"The machine-bent knees proved to possess greater elasticity than the natural ones, and after springing them inwards or outwards some distance, and then allowing them to go back, upon the pressure being applied the second time, it was found, in one trial the knee sustained a slightly greater pressure, but in another about six per cent. less."

MEDINA CEMENT CONCRETE BUILDINGS.*

Messrs. Francis, Brothers, of Vauxhall, have recently constructed huts suitable for the working-classes, or for soldiers, of concrete, made of sea beach or washed gravel stones, with a portion of cement. The quantity of this latter material is small, and, not being sufficient to fill the interstices between the stones, it produces a hollow or honeycomb wall, which dries almost immediately, rendering the building fit for being inhabited in a week after its erection. The concrete forming the wall is laid between an outer and inner row of planks, with an interval of nine inches between them, and these may afterwards be removed and used for flooring, doors, &c. At the

* A model of one of these buildings has been deposited at the Society's house.

end of two days, the stuccoing within and without may be proceeded with. The chimney stack is also formed of concrete, lined with common drain pipes. On the top of the wall a wooden plate runs all around, to receive the roof, which it is proposed should be covered with corrugated glazed tiles of a peculiar form, combining lightness with strength, and repelling the heat. These buildings are stated to be very permanent, are uninflammable, and capable of erection at a moderate price, as a hut with an internal measurement of 40 feet by 20 feet, may be constructed for about £100; or if with party walls, converting it into a pair of labourers' cottages, with three rooms each, the cost would not exceed £140. Two military huts were erected upon this principle at Shorncliff encampment; and a certificate granted to Messrs. Francis, from the office of the Inspector-General of Fortifications, states as follows:—

"These buildings give great satisfaction, and have been highly approved of by the officers and soldiers who inhabit them. They are superior to 9-inch brickwork, as that description of external wall will not keep out the wet without being plastered, whereas the Medina Cement concrete huts are, from the nature of their construction, necessarily plastered, and are therefore warm and dry.

"They are also very strong and substantial, and as well adapted for two stories as one. Their great advantage over brick, or, indeed, wooden huts, is the rapidity and economy with which they can be constructed, combined with a durability little, if at all, affected by time."

MANURES AND DEODORISERS.*

The following is extracted from a lecture delivered at the Bakewell Farmers' Club, by Alexander M'Dougal, Analytical Chemist, Manchester:—

"There are many deodorisers, but they are many of them injurious to the farmer. *Chloride of zinc* and *nitrate of lead* would deodorise, but they would introduce a metallic poison into the manure, besides being very costly. *Chloride of lime* is very expensive, and gives out a most irritating gas, which is highly pernicious to the lungs; and, besides this, it destroys the ammonia, the most valuable ingredient in manure. *Gypsum* requires to be used in great quantities, and after action it becomes highly offensive, being itself liable to decomposition. *Copperas*, or *sulphate of iron*, is mischievous to animal life, and destroys by insolubly combining with the phosphoric acid of manure, so essential to the nutrition of plants. *Charcoal* deodorises, but it burns up the manure, and deprives it of all its organic properties. All these deodorisers are bad for the farmer, for they all more or less destroy the manure.

To obviate this evil a composition is required, consisting of two acids and two bases. Sulphurous acid to remove the offensive smell, carbolic acid to prevent putrefactive fermentation, a little lime to neutralise and dry the carbolic acid, which is oily, and magnesia to combine with and preserve the phosphoric acid and ammonia.

This is the theory of the only disinfecting powder available for agricultural purposes, and which, during the late war, though but lately introduced, was so rapidly found to surpass every other for disinfecting stables, hospitals, &c., that the Secretary for War received a requisition from nearly every transport in the service begging to be furnished with it. Its use in vaults, graveyards, and coffins has been so satisfactory, and withal so cleanly and pleasant, as to afford, at a mere nominal cost, an entire relief from the most distressing annoyance incidental to the performance of our last duties to the dead.

It sweetens the air of sick rooms, so often injurious to patients, and sickening to nurses and surgeons. A chemist of one of the metropolitan hospitals told us that he used it constantly in all the wards of the hospital with which he was connected. Only used once a week, either dry or dissolved in water, it keeps water-closets sweet, as we know from experience. * * * * Of its uses in stables we have the testimony of Mr. Murray, of the Horse Bazaar, Manchester, who keeps always on hand about sixty of the best horses in England. He says, "I have been using it in my stables for nearly a year and a half—with the very best effect, both as regards the health of my horses and the saving of straw. It removes all smell from urine, excrements and all other fermenting and putrifying matters, at once, and renders the air perfectly sweet and healthy; it has also the advantage of being obtained for a very small amount, and greatly improves the quality of the manure." At Mr. Murray's establishment the dung-heap generally accumulates to about 500 tons, and it is removed without offensive smell, with all its original virtues unimpaired.

Its application to the common sewers of towns is an interesting subject of consideration. It has the power of sweetening the whole atmosphere of a populous city; and, supposing the sewerage of London to be all collected as proposed, in great tanks, a few miles below the metropolis, these tanks would be made perfectly inoffensive to the neighbourhood, while the farmers could be supplied to any amount with the richest nourishment for their fields, nourishment which would not offend the sense of smell, either in its removal or its distribution, and which would greatly increase the quantity as well as quality of their crops, not to speak of the very probable effects in the diminution of the myriads of destructive animalcules that derive their life and being from putrescent matter, hatched and brought forth in the air as the only means the air has of getting rid of the offence, and at the same time administering rebuke to man by converting the gas into living and destructive organism."*

TELEPHONY.

A paper was read before the French Academy of Sciences, by M. Sudre, "On a Method of Communicating Signals at a Distance by Means of Sound," to which the name of Telephony has been given. The following is an abstract of it:—

In 1817 M. Sudre, at that time professor in the school at Soreze, conceived the idea of substituting musical sounds for the voice, and thus forming a musical language, in which combinations of the notes of the gamut are employed instead of the articulations of the human voice. In 1827, he first applied his plan to the transmission of military words of command. The number of notes employed at that time was seven, two more than those in the ordinary regulation trumpet. General Desprès induced M. Sudre to reduce the number to five, which was soon done, and the regulation trumpet was thus made available for the transmission of every order which could possibly occur. A trial was made in the Champ de Mars with perfect success, but M. Sudre thought it desirable still further to reduce the number, and he now only uses three notes, *sol*, *ut*, *sol*, separated by such considerable intervals, that the least practised ear cannot confound them. Each signal has at the most three notes; and two consecutive signals, of which the first is only to draw attention, serve for the transmission of any of the orders previously inserted in a dictionary of military or naval tactics. No difficulty is found in translating even the name of a town into this telephonic language, whenever it is found necessary to render an

* On the Preservation of the Natural Manures. Whittaker and Co., Ave Maria-lane.

* It is stated that the deodoriser consists of clay, lime, and carbolic acid. Those who are desirous of experimenting may purchase the material at a reasonable cost, at Messrs. Wickmin and Bridges, Chemists, Regent-circus, Oxford-street.—ED. S. A. J.

order complete and intelligible. In fact whole sentences may be transmitted to a distance by this means, if sufficient time and care be given. If there seemed reason to fear that an unpractised ear might be unable to distinguish the three notes employed, the second would be repeated twice, and the third three times, so as to obviate the possibility of confusion.

Whenever the trumpets are not found to be loud enough, the drum is employed, by substituting a special effect for each note, of which the meaning has been previously agreed upon; and for still greater distances, even cannon may be used with perfect success, for the telephonic system is applicable to all these methods of transmitting sound.

M. Sudre has also introduced a system of visible signals which only requires three distinct signs. In the day time three coloured discs are used, and at night three lamps, or, for great distances, signal-lights; and this is all that is necessary for transmitting any of the orders contained in the dictionary of tactics.

Both the colour and relative position of the discs convey a meaning, and it is only necessary to arrange them at a convenient height for their object to be quickly understood. The Committee of Economic Science, belonging to the *Société d'Encouragement*, have given it as their opinion that this telephonic system is applicable to railways where the utility of such a simple and rapid means of communication would be strongly felt.

PRINTING SILK AND OTHER FABRICS WITH GOLD, &c.

An invention for effecting this object has lately been patented by Mr. Rogers Ruding, of Bunhill-row. It consists of employing shellac, in a refined and powdered state, together with a heated printing surface, for printing silks and other woven fabrics with gold and other metal leaf or powder. For this purpose the dried powder of shellac, obtained by precipitating it from a solution, is dusted evenly over the surface which is to be printed with gold or other metal leaf, or it might be metal powder, which is to be spread over the shellac, and then a heated printing surface is to be applied, by which the metal will be caused to adhere to those parts where the printing impression is made by reason of the melting of the shellac, whilst the unmelted shellac and the metal which is over other parts of the fabric may be brushed off.

The shellac having been dissolved in spirit and precipitated, as is well understood, and dried, the purified gum is employed in the following manner:—The dried powdered gum is dusted evenly on the parts of the silk or other woven fabric where the device is to be produced, the gold or other metal leaf is placed thereon, and a heated tool or metal surface, having thereon the desired device or pattern, is to be pressed on to the leaf; the heat will melt the gum below, and the metal leaf will adhere at those parts where the pressure of the heated surface comes, whilst the other parts of the gum will remain unmelted, and may be removed, together with the excess of metal leaf. In place of gold or other metal leaf being used, gold or other metal powder may be employed and placed on the fabric over the powder of the gum, and, by means of the heated tool or surface, a like result will be obtained. The object of the invention, it will be seen, is, that the gum should, when on the fabric, be in a dry state, so that when the gold or other metal leaf or powder is laid on, it shall not adhere, and shall only be made to do so in those parts where a suitable heated tool or surface is pressed; and it is found that a thin and clear solution of the gum may be spread all over the surface of the silk or other woven fabric, which will only act slightly to stiffen the fabric, and gold or other metal leaf or powder may be made to adhere thereto in pattern in those places where a heated tool or pattern is impressed, as above explained, for it will be found that the gold or other metal leaf or powder laid on such prepared fabrics will only adhere at the parts where the impression is made, the other parts of the gum not melting.

Home Correspondence.

NEW METHOD OF SPLITTING TIMBER.

SIR,—A method of preparing large timber for the circular saw has been employed, (for the first time I believe) by the manager of my saw-mills in this neighbourhood, which appears to me to cause so large a saving of labour, and consequently of expense, that I think it worth drawing the attention of practical men to it.

Our principal timber of large size here is *beech*, planted early last century, when it was a wood much in use for colliery tram-ways. At my saw-mill we have only circular saws, not of sufficient diameter to divide large trunks, which had, therefore, to be sawn by hand, previous to their being brought to the bench, adding much to the expense of the work, and reducing, of course, the profit upon the timber, which sells at so low a rate that it is desirable as much as possible to economise its conversion. It struck my manager that *gunpowder* might be used for the purpose of splitting the trunks; and he at first tried *two* blasts, but has now ascertained that *one* blast is sufficient to split a log of considerable length, which it does generally almost as clean as the saw. He bored a hole with an augur, one inch in diameter, about one-third the length of the log from the butt-end, as near as possible in the centre, and in depth a little more than half the thickness of the trunk; the powder and fuze are then put in and the hole filled up with sand. I have seen several logs of *beech* and one of *ash* blasted in this way, and split in two equal parts almost as smooth as if sawn; I am told that it also succeeds with elm, but not with oak.

For the less costly kinds of timber the saving that might be effected, (amounting here to several shillings per tree,) were this plan generally adopted throughout the kingdom, would be very large.

I am, &c.,
W. C. TREVELYAN.

Wallington, Newcastle-on-Tyne, Sept. 20, 1856.

Proceedings of Institutions.

CROSBY HALL EVENING CLASSES.—A soirée and exhibition of works of art took place on Tuesday evening last, to inaugurate the winter session of the Evening Classes. The large hall and rooms were filled with a very respectable company. Among the contributors to the exhibition may be mentioned,—Her Majesty, his Royal Highness Prince Albert, the Hon. East India Company, the Council of the Society of Arts, Wigram Loftus, Esq., &c. There were some blocks from Nineveh, a good collection of ferns, photographs, whole tables of articles of antiquarian interest, several good paintings, and works of modern art, all of which had been sent by the friends of the Institution, to the value of nearly a hundred thousand pounds. The chair was occupied by the Right Honourable the Lord Mayor. On his right sat the Lady Mayoress and several other ladies. Mr. Alderman Finnis, Apsley Pellatt, Esq., M.P., the Rev. Dr. Booth, F.R.S., and other gentlemen who take an interest in these Institutions were on the platform. The Secretary read the report, from which it appeared that financial difficulties had very much crippled the efficacy and usefulness of the classes, and that an effort was being made to relieve the Institution of a debt of £500. The report stated that thirteen certificates and three

prizes had been awarded to the students of the Crosby Hall Evening Classes at the late examinations of the Society of Arts. The Rev. C. Mackenzie explained the general object of the Institution. The Lord Mayor spoke on behalf of a more general and extended system of education for young men and mechanics. Whatever others might say to the contrary, his lordship was satisfied, from his own experience (which had been rather extensive), that educated workmen were more valuable to their employers, more moral and orderly in their habits, more reasonable, and better managed. The ignorant workman was often immoral, idle, and vicious. His lordship deplored the difficulties under which Institutions were labouring. He knew that many of them were struggling for existence, and very few could be said to be out of debt. Apsley Pellatt, Esq., M.P., the Rev. Dr. Booth, F.R.S., and Alderman Finnis subsequently addressed the meeting, when the audience separated to inspect the exhibition. Great praise is due to the gentlemen for the immense trouble they have taken to get together so valuable a collection.

ROYAL POLYTECHNIC INSTITUTION.—A meeting of the gentlemen who have been engaged to conduct the evening classes at this Institution took place on Thursday morning. Mr. J. H. Pepper occupied the chair. He explained the general object of these classes, and the reasons which had induced him to organize a more systematic course of scientific instruction. He had always been anxious to make the Polytechnic not only a place for popular amusements in science, but an Institution in which the elements of science should be regularly and accurately taught. The situation and appliances he thought well adapted for such a purpose. He hoped in the course of time to establish a trade school, similar to those of Wandsworth and Bristol, where boys would be taught, at a small charge, those principles of science upon which our industrial success depended. Without some such knowledge labour must be a dull round of lifeless drudgery. These classes would commence in October, and terminate a few weeks previous to the Annual Examination of the Society of Arts. He regarded this movement of the Society of Arts as one of great educational importance. A young man could go up without expense, and be examined by a distinguished Board of Examiners, upon whose judgment and accuracy the public must have confidence. Although it was not imperative that all who attended these classes should go up for examination, yet he hoped that nearly all would avail themselves of the opportunity. Every young man in entering into life should carry with him the evidence of mental industry and effort. He was anxious to impress upon the gentlemen present the national importance of these examinations, and he hoped the teaching would have reference to such results. It might be asked what reward there would be for all this work? Of what value was the Society of Arts certificate? He would tell them. The Society of Arts had just opened a register, containing the names of all those who obtained certificates at the late examination; this register would be open for consultation free of charge. From the register many appointments would be made. All those companies and large employers of labour who had signed the declaration would, no doubt, fill up vacancies in their establishments with young men whose names were on this register. Already some good appointments had been made, and several large merchants in the city had promised others. How much better it was for a young man to work out his own independent position rather than importune friends for letters of recommendation and testimonials, which are often regarded as utterly worthless. Let the young men who attended these classes be industrious, and they would reap their reward in due season. The books and apparatus necessary for these classes would be supplied through the Society of Arts by the Privy Council. He had started these classes, not with any desire to make a profit, but to meet what he considered a want. Every farthing after the ordinary expenses of the class rooms were paid, would go for the benefit of the teachers. And in the selection of gentlemen to conduct these classes he had satisfied himself of their reputation and ability for such a work. He had placed the general direction of these classes under Mr. Buckmaster, one of the science masters of the Department of Science and Art, and well acquainted with the duties of such an undertaking.

HORNCASTLE.—An exhibition of works of art, and other objects of interest, will be held, on the 14th, 15th, and 16th of October, in the Hall of the Corn Exchange, on the occasion of the opening of the new rooms of the Mechanics' Institution. The exhibition will comprise pictures, drawings, engravings, curiosities, models, ancient armour, and a variety of other objects, contributed by the Society of Arts, the Art Unions of London and Glasgow, Sir Henry Dymoke, Bart., and several other gentlemen of the town and neighbourhood. Persons willing to contribute are requested to forward a list of the articles they propose to send, to the librarian before the 1st day of October, or as soon after as possible. In addition to the exhibition a lecture will be delivered each evening in the library of the Institution.

OLDHAM.—The opening of the Oldham Lyceum took place yesterday. It was to be celebrated by a procession and lunch in the morning, and by a tea and *soirée* in the evening. Amongthe guests invited, and who honoured the ceremony, were Lord Stanley, M.P., Sir J. K. Shuttleworth, Bart., William Brown, Esq., M.P., James Heywood, Esq., M.P., W. J. Fox, Esq., M.P., J. M. Cobbett, Esq., M.P., Colonel and Lieutenant-Colonel Burns (sons of the Scottish bard), the Rev. Dr. Vaughan, and the Mayors of Manchester and Ashton-under-Lyne. The procession, which included the authorities of the borough, the guests, and most of the leading inhabitants, formed at the Town-hall soon after 12 o'clock, and, headed by a band of music, proceeded through the principal streets to the new building, which is situate in Union-street. The building is in the Italian style of architecture, in two stories, with underground rooms for schools, and attics for class rooms, above which is an observatory, commanding an extensive range of country. The two principal stories contain a fine news-room and lecture-hall, besides club, board, and other rooms. The cost of the building has been upwards of £5,000. James Platt, Esq., the president of the Institution, in his opening address, said, that it was little more than twelve months since he had the honour to lay the first stone of this splendid building, and it was now his pleasing duty to formally open the Lyceum. It would not be inappropriate that he should refer to the origin of this great and good work—a work that has enlisted the sympathy and co-operation of all classes, and, indeed, of all parties. About three years ago, it was a consideration how best to promote the interests of the Institution. It had then attained a very respectable position, but it was thought possible very greatly to promote the interests of the Lyceum if funds could be raised for the new building. The difficulty was, however, as usual, how to raise the funds. It was ultimately decided to do it by means of an Industrial Exhibition, and it was hoped, by the manner in which it was got up, and by the completeness of its several departments, to show the public that it deserved their support. The zeal and anxiety displayed by the officials and members of the Institution, and the efforts that were made to obtain contributions, ought never to be forgotten. Such self-sacrifice must always attain success, and could not fail to inspire all those who took an interest in the well-being of such an Institution. He would not say more than that the result was, that one hundred thousand people passed through the walls of the exhibition; and at the close the following passage occurs in the report issued by the directors:—"That notwithstanding the immense crowds that often thronged the room, al-

most to suffocation, not a single article of value was either destroyed, injured, or taken away. The result financially was equally gratifying, a surplus of more than £2,000 remaining after paying all expenses." About £1,800 was raised in this way, making £4,000 altogether; and so far, therefore, all had succeeded very well. A building has been obtained, which is eminently adapted for the purpose for which it has been erected. But the question has already been asked—"Will the working classes avail themselves of the advantages which it affords, to the extent which has been anticipated?" The reply made to that question, at the moment, was, "That the working-men should answer that question themselves. Their honour is now in their own keeping." It was satisfactory in so short a time to be able to say that that question has already been answered. Within the last three days the names of no less than 200 individuals, as additional subscribers, have been sent in. At the same time, it must not be concealed that the work is only half accomplished. In the words of Lord Ashburton, in addressing the Society of Arts of London, on a recent occasion—"A man goes forth into the world as a soldier goes into a campaign; his wants are boundless, his means of carriage are small; can any service be greater than that of planning out and assorting his pack, of rejecting all that may encumber his movements, and of selecting all that shall afford materials for the work he has to do?" In other words, that the knowledge sought to be conveyed shall be of a thoroughly practical character, especially adapted to the circumstances of those whom it is our object to benefit. Now, in order to give consistency to the efforts which are being made by the directors of this Institution in re-arranging the classes, it is proposed that a general annual public examination be held; and in order to set the matter going at once, Mr. Platt said that he should have very great pleasure in contributing a silver medal annually, and a sum of five guineas, to the best mathematician. He had no doubt other prizes would be given, and also that those prizes will be greatly valued by the young men who obtain them, not so much on account of their intrinsic worth, as for the mark of distinction which they undoubtedly confer. When he considered the enormous increase in population, and in material wealth, which is here taking place day by day, and the activity of mind and body which it necessarily induces, he felt that they, too, have something of which to be proud; and he could not shut his eyes to the fact, that the northern manufacturing districts of England are destined to exercise a most important influence on the future policy of the country. If this be so, surely it is a noble ambition to endeavour to raise the moral and intellectual standard of the people. Such had been their ambition in erecting this building; and in full confidence that the result will more than answer our fullest expectations, he (Mr. Platt) had now the pleasure and the great honour of formally declaring it opened. The doors of the Lyceum were then opened, and the company went through the building to inspect the various rooms. The lunch took place at two o'clock, and the proceedings concluded with a *soirée*, at which Lord Stanley, M.P., presided, and was supported by Sir J. P. Kay-Shuttleworth, Bart., M.P., Mr. W. J. Fox, M.P., Mr. Heywood, M.P., and other gentlemen, many of whom addressed the meeting at considerable length.

PATENT LAW AMENDMENT ACT.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, September 19th*, 1856.]

Dated 28th August, 1856.

2003. Charles Durand Gardissal, 10, Bedford-street, Strand—A mode of treating and preparing sea-weeds or marine plants for manure. (A communication.)
2005. Richard Archibald Brooman, 166, Fleet-street—Improvements in shuttles. (A communication.)
2007. Thomas Watson, Poland-street—An improved beer engine, lever, or lifter, and apparatus for fitting the same to counters.
2009. Jean Baptiste Feauveau and Louis Alexander Legrand, Brussels—An improved apparatus for the purification and the combustion of gas.

Dated 29th August, 1856.

2013. John Brown, Pendleton, Lancashire—Improvements in swinging hammocks, and in the construction of bedsteads or couches, and in apparatus connected therewith.

Dated 30th August, 1856.

2014. John and William Fletcher, Salford—Certain improvements in the construction of weighing cranes or other similar elevating machines.
2015. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in fire-arms. (A communication.)
2016. James Blake and Francis Maxwell, Kitchen-street, Liverpool—Improvements in the manufacture of soap. (A communication.)
2020. Charles Goodyear, Leicester-square—An improvement in combining gutta percha and asphalt or pitch.
2021. Hezekiah Conant, Connecticut, U.S.—A new and useful improvement in fire-arms.
2022. Daniel Sutton, Banbury—An improvement in the manufacture of cast-iron cooking kettles and such like hollow ware.
2023. John Gregory, Nelson-square—An improved fish joint or method of connecting rails.
2024. Manoah Bower, Richard Peyton, and Joses Weaver Downing, Birmingham—Improvements in metallic bedsteads, cots, couches, and other such like articles.

Dated 1st September, 1856.

2025. George Hamilton, Blackland Mill, Paisley, N.B.—Improvements in the treatment or finishing of textile fabrics.
2026. Matthias Edward Bowra, 63, Basinghall-street—Improvements in the laying or placing of rails or chairs for railway and other purposes in the shape of beds or springs or elastic sleepers.
2027. Thomas Pinfold Hawkins, Birmingham—A new or improved manufacture of wire chain.
2029. Richard Hill Norris, M.D., 46, Stafford-street, Birmingham—Certain improvements in photography by the use of collodion in a dry condition, and for a means of transfering photographic films.
2030. Alfred Vincent Newton, 66, Chancery-lane—An improved charger for shot-pouches. (A communication.)
2031. Edward Henry Cradock Monckton, 77, Chancery-lane—Improvements in blast furnaces for smelting ores.
2032. Frederick Levick, junr., Cwm Celyn and Blaina Iron Works, Monmouth—Improvements in the construction and working of blast furnaces for the smelting or making of iron.

Dated 2nd September, 1856.

2034. Maurice Aron, 39, Rue de l'Echiquier, Paris—An improved leaven.
2935. Ambrose Archer, Old Swan, near Liverpool—Improvements in the manufacture or preparing for use "founders' charcoal blacking," "coal dust," "loam," and "faceing sand."
2036. John Bate, Birmingham—Improvements in folios, clips, or files for holding letters, invoices, and other documents.
2037. James Apperly, Dudbridge, near Stroud—Certain improvements in the process of preparing cotton, wool, flax, and other fibrous substances for spinning, and in carding and preparing machinery.
2038. Pierre Joseph Guyet, Paris—An improved method of stopping or retarding railway carriages and trains, and of warming the interior thereof.

Dated 3rd September, 1856.

2039. George Cumming Thomas, 67, Gracechurch-street—An improved method of making steel. (A communication.)
2040. Joseph Lamb, Manchester—Certain improvements in machinery or apparatus for preparing, slubbing, and roving cotton and other fibrous substances.
2042. Samuel Hallen and Edward Hallen, Cornwall-road, Lambeth—Improvements in rolling metallic substances.
2043. John Metcalf, Newton Heath, near Manchester—Improvements in the manufactnre and treatment of tar oil for dissolving india-rubber, gutta-percha, gums and gum resins, and also in deodorizing all fabrics, wood, or any article impregnated with tar oil or the products from coal tar.
2044. Louis Cornides, 4, Trafalgar-square—A new method of dressing or preparing hides, skins, intestines, and such like animal substances.
2045. Simon Ghidiglia and Louis Turletti, 39, Rue de l'Echiquier, Paris—An improved buckle.
2046. Edmund Pim Spiller, Holborn-hill—Improvements in the construction of chamber lamps.
2047. John Roberts, Upnor, Kent—An improvement in the stoppering or closing of jars, bottles, and other vessels, applicable also to the joining of earthenware and other pipes.
2048. Jules Mozard, 6, Dufour-place, Golden-square—Improvements in the construction of miners' lamps.

Dated 4th September, 1856.

2050. William Bishton, Wolverhampton—An improvement or improvements in boats for inland navigation.
2051. Thomas Morrison and Samuel Amphlet, Birmingham—A new or improved fastening for belts, bands, and other such like articles.
2052. Constant Jouffroy Dumery, Paris—Improvements in steam engines.
2053. Joel Tanner Hart, 67, Gracechurch-street—Improvements in apparatus for modelling statuary from life, and for measuring and copying statuary and other uneven surfaces.

2054. Evan and George Peter Leigh, Manchester—Improvements in parts of machinery or apparatus used in preparing and spinning cotton and other fibrous substances.
2055. George Alfred Lewis, Bristol—Disconnecting and raising screw propellers.
2056. Eugene Armand Roy, John Archibald Hall, and William Thomas Binns, Camden-town—An improved means of insuring draught in smoke flues or chimnies.
2057. William Keates, Liverpool—Improvements in the process of reducing copper to the metallic state from ores and other materials containing copper, and in the furnaces employed therein.
2058. George Anderson, Queen's-road, Dalston—Improvements in the combustion of tar and other similar matters in heating gas retorts, and in the consumption of smoke arising therefrom, and from other fuels used therewith.
2059. Captain John Montagu Hayes, R.N., Southsea—An improvement in the construction of cartridges for fire-arms.
2060. William Moberly, Ravenhead, Lancashire—Improvements in the grinding and polishing of curved and rounded surfaces. (Partly a communication.)
2061. John Loude Tabbener, 4, Trafalgar-square—Certain improvements in smelting ores.
2062. Benjamin O'Neale Stratford, Earl of Aldborough, Stratford-lodge, Wicklow, Ireland—Improvements in aerial navigation and in the apparatus connected therewith, parts of which are applicable to locomotion generally.
2063. Richard Archibald Brooman, 166, Fleet-street—Improvements in the construction of buildings and parts of buildings. (A communication.)

Dated 5th September, 1856.

2064. John Benjamin Dancer, Manchester—Improvements in photographic cameras and in the apparatus connected therewith.
2065. Henry Edward Cradock Monckton, Parthenon Club, Regent-street, and William Clark, Upper-terrace, Islington—Improvements in machinery or apparatus for tilling or cultivating the soil.
2066. John Johnson, Single-street, Mile-end—Improvements in railway carriages.
2067. Alexis Eugène Duchateau, Paris—Improvements in stamp presses and stamps used therewith.
2068. William Smith Mitchell, Cornhill, and Charles Martin Ernest Gartner, Lower Ashby-street, Northampton-square—Improvements in the construction of watches.
2069. Ralph Reeder, Cincinnati, U.S.—An improved universal dial and chronometer compass.
2070. Robert Wilson, Patricroft, Lancashire—Improvements in valves and in apparatus connected therewith.
2071. Thomas Burstall, Southall, Middlesex—Certain improved machinery for manufacturing bricks and tiles from clay alone or mixed with other materials.
2072. John Johnston, Ohio, U.S.—Improvements in photographic plates. (A communication.)
2073. Charles Louis Frederick Helrigel, Great James-street, Bedford-row—Improvements in lithographic printing presses.

Dated 6th September, 1856.

2075. Joseph Anelli, 2, Talbot-villas, Paddington—A crampon to prevent horses slipping in frosty weather.
2077. John Juckes, Dame-street, Islington—Improvements in stoves or fire-places.
2078. Gustavus Palmer Harding, Kingsland—Improvements in the manufacture of hats and other coverings for the head, and of parts thereof.
2079. Peter Wright, Dudley, Worcester—An improvement in the manufacture of anvils.
2080. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cutting round files. (A communication.)
2081. Charles Louis Lapito, 2, High-street, Marylebone—A machine for manufacturing of mortar and concrete.
2082. William Wilkens, Baltimore, U.S.—Revolving cylinder battery or cannon, and apparatus connected therewith. (A communication.)
2083. Peter Armand le Comte de Fontainemoreau, 39, Rue de l'Echiquier, Paris—Certain improvements in making artificial stones for statues and ornamenting purposes. (A communication.)
2084. Henri Etienne Trottier, 39, Rue de l'Echiquier, Paris—An improved portable bath.
2085. Paul Rapsey Hodge, Albion-grove, Islington—Improvements in grinding wheat and other farinaceous grains, and in the treatment of the products therefrom.

Dated 8th September, 1856.

2086. Thomas Craig, Glasgow—Improvements in ruling paper and other materials.
2087. Félix Estivant, Paris—Improvements in casting metal tubes.
2088. Adolphe Gilbert Chalus, Paris—Certain improvements in stopping bottles and other vessels.
2089. John Fowler, junr., Havering, Essex—Improvements in machinery or apparatus for ploughing and tilling land by steam.
2090. Alfred Dalton, Chester—Improvements in smelting ironstones and ores, and in furnaces used for that purpose.
2091. Robert Bamford, Preston—Improvements in looms for weaving.
2093. Francis Mitchell Herring, Basinghall-street—Improvements in applying magnetic action to combs and brushes.
2094. Thomas Restell, New Kent-road—Improvements in breech-loading fire-arms and ordnance.
2095. William Petrie, Woolwich—Improvements in the manufacture of sulphuric acid and the apparatus employed therein, parts of which improvements are applicable to the manufacture of nitric, hydrochloric, and other acids.
2096. Alfred Vincent Newton, 66, Chancery-lane—Improved machinery for cutting india-rubber and other substances into threads or narrow strips. (A communication.)

Dated 9th September, 1856.

2098. William Pidding, Trinity-terrace, Southwark—Improvements in the preparation and manufacture of certain piled, corded, or other fabrics,

WEEKLY LIST OF PATENTS SEALED.

Sealed September 17th, 1856.

640. Peter Armand le Comte de Fontainemoreau.
645. John Drury.

Sealed September 19th, 1856.

651. Richard Morgan.
670. William Drummond.
671. James Murphy.
673. William Brierley and James Platts Brierley.
674. Walter Glover.
675. Henry Pratt.
680. Henry Brierly.
690. Thomas Heaton.
745. Joseph Webber.
756. John James Rippon.
768. Charles Durand Gardissal.
772. Henry Henderson.
790. Frederic Grice.
811. James Bannehr.
843. William Terry.
876. Robert Stirling Newall.
1226. Robert Bell.
1290. Henry Bessemer.
1322. MontagueRichardLeverson.
1348. Robert Harlow.
1405. William Jacot.
1424. Joseph Davis.
1473. HenryHussey Vivian, Bernhardt Gustav Herrmann, and William Morgan.
1474. George Dyson.
1529. Thomas Frederick Henley.
1547. John Hay and James Hay.
1578. Joseph Lewtas and John Humphreys, junr.
1623. Alexander William Williamson.
1638. Robert Harrington.
1648. John Pope.
1676. Duncan Cameron.
1733. Sven Johan Agrell Burg.

Sealed September 23, 1856.

694. Peter and George Brown.
695. Richard Husband.
696. John Tysoe, Charles Tysoe, and Peter Foxcroft.
711. William Ball.
712. Robert Collins.
721. David Lowe.
747. James Harrison.
749. James Harrison.
755. Francis Puls.
763. William Nimmo.
779. Alfred Vincent Newton.
791. Frances Young.
801. James Samuel and John Nicholson.
827. Julian Bernard.
1317. Joseph Bauzemont.
1509. Joseph James Foot.
1613. Sewall Short.
1693. John Cowley.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

September 15th.

2192. Peter Rothwell Arrowsmith and James Newhouse.

September 16th.

2152. David Mushet.
2154. Henry Meyer.
2167. Henry Constantine Jennings.
2169. Rd. Archibald Brooman.
2188. Alfred Vincent Newton.
2227. Jean Alexandre Labat, jun.
2239. Robert Brisco and Peter Swires Horsman.
2241. Caleb Bloomer.
2255. William Joseph Thompson.

September 18th.

2190. James Baldwin.
2235. Peter Armand le Comte de Fontainemoreau.

September 19th.

2181. Ferdinand Potts.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3873	Sept. 13.	Shirt	Joseph James Welch, and John Stewart Margetson..	Cheapside.
3874	,, 15.	Pedestal Urinal	Wilcox and Co.	Millwall Pottery.
3875	,, 15.	Camp Oven, or Pie or Bake Pan	Thomas Green	Coseley, near Bilston.
3876	,, 17.	Fastening for Articles of Dress	Spilsbury and Downes	Huggin-lane, Cheapside.
3877	,, 17.	Improved Shirt	Henry Richard Freeborn	Manchester.
3878	,, 18.	Oude Wrapper	Benjamin Benjamin	74, Regent-street.
3879	,, 20.	A Carriage Frame, with Wheel, Breaks, and Guard, for suspending Cots and Carriage Bodies, for Infants, Adults, and Invalids	Henry Lensey Burton	1, Goulden-terrace, Islington.